ELEMENAL COMPOSITION DETERMINATION OF SOIL SAMPLES FROM "METEORITE MORASKO" RESERVE, POLAND. E. A. Miśta[1], Z. Tymiński[1,2] and P. Kalbarczyk[3], [1]National Centre for Nuclear Research, Otwock-Świerk, Poland, *ewelina.mista@ncbj.gov.pl*, [2]Polish Fireball Network, PKiM, Poland, *z.tyminski@polatom.pl*, [3]Institute of Nuclear Chemistry and Technology, Warsaw, Poland, *p.kalbarczyk@ichtj.waw.pl*.

Introduction: In 2014, 100 years have passed since the discovery of Morasko, type IAB iron Polish meteorite, but there is still a number of subjects worth the detailed investigations of seven depressions supposed to be impact craters in Morasko.

Presented in this paper results of research conducted in meteorite fall region located in the „Meteorite Morasko" reserve gave information about soil elemental composition in this region. The studied samples were taken from reference points in strewnfield area. Research was based on area query, sampling of environmental materials and then made the preliminary elemental composition determination by ICP MS method. The analysis gave information about elemental distributions correlations between elements which can originate from extraterrestrial matter.

Methodology: In situ sampling procedure of environmental material, mainly soil samples, from fall meteorite region in the reserve "Meteorite Morasko" was based on the study of map of extraterrestrial material reported by meteorite hunters [1]. Three regions were selected for sampling: from the periphery of fall region, east part of reserve (*Region A*), the area with the range of 0,003 - 0,5 kg of meteorite finds – on south from the Meteorytowa Street (*Region B*) and the area with concentration of few meteorites above 50 kg located in the crater area, which geological origin is unclear until now [2, 3] (*Region C*). Photo 1 shows demonstratively view of the *Region C*.

Photo 1. Region with craters (probably impact) in the "Meteorite Morasko" reserve. The sampling *Region C* (photo by T. Jakubowski).

There were 17 soil samples taken at the depth of 10 cm, collected from 3 selected regions *A-B-C*. The elemental composition of soil samples was preliminarily determined using ICP MS technique (Inductively Coupled Plasma Mass Spectrometry; Spectrometer type ELAN DRC II Perkin Elmer SCIEX). The heavy metal concentration like U, Th, Cu, Zn, V, Mo, Ni, Sb, Fe, Cd, Pb were determined, also Mn concentration were studied as reference.

This study is mainly focused on Mn and elements which could originate from meteorite matter, namely: Fe, Co Ni.

Results and Discussion: The work hypothesis in submitted investigation was that contents of Fe, Ni and Co in soil should be determined also by concentration of extraterrestrial matter in the sampling points. Therefore contents of studied elements should be arranged as follows: Region C > Region B > Region A. In this type of study it should be taken into account that the elemental composition of soil samples is determined also by geological and anthropogenic conditions of sampling regions.

There were studied three types of correlation: Fe/Mn, Co/Mn and Ni/Mn. The Mn concentration in soil shows Fig.1. Due to the method parameters there are no significant anomalies in abundance, therefore this element was chosen for the external reference.

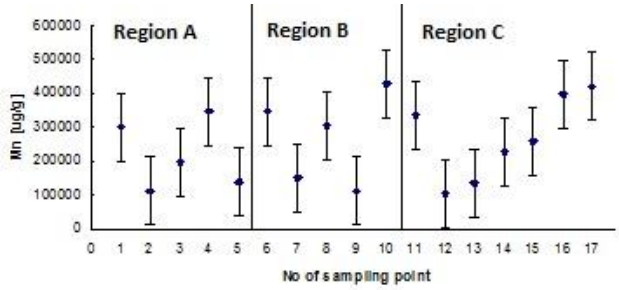

Fig.1. Concentration of Mn [µg/g] in all collected soil samples (1-17) from "Meteorite Morasko" reserve determined by ICP MS method, errors 10%.

The *Region A* from which five samples were taken is located in elevation in area with agricultural character. The samples no 2 - 4 originate from top of the elevation, sample no 5 is from cultivated field which is outside of the reserve. This fact can explain highest con-

tent of Fe in samples 2 - 4 with respect to the rest samples from *Region A* (Fig.2). Also average content of Ni are highest in this region (Fig. 3). This chemical component can have also anthropogenic character.

Region B and *C* are response to proper areas of meteorites fall with different concentration of extraterrestrial material. Most probably due to the lower amount of the extraterrestrial matter the *Region B* has lower concentration of Fe than *Region C* (Fig. 2).

The average values of Fe/Mn ratio for three selected sampling regions are: the *Region A* – 55.0, the *Region B* – 25.4 and the *Region C* – 68.7. The highest Fe concentration shows the *Region C* which corresponds to the region with the highest number of meteorite finds. Increased content of Fe/Mn occurs in the *Region A*. This may be caused by mentioned above geological and anthropogenic factors.

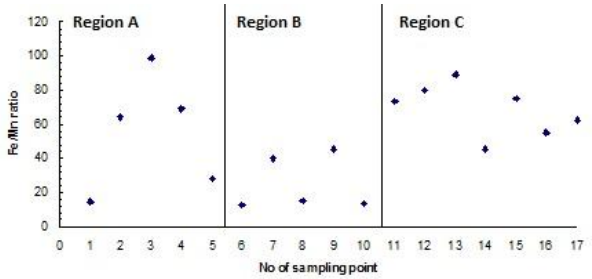

Fig.2. Fe/Mn ratio in soil samples from the "Meteorite Morasko" reserve determined by ICP - MS method, measurement errors 10%.

As a reference to the Morasko area the elemental determination was made for soil sample originate from Pułtusk region. Soil sample was taken from the ground (15cm deep) under the 1kg Pułtusk meteorite found in 2008. The Pułtusk sample has much higher content of Fe, the Fe/Mn ratio is 111600. The increased value indicates cosmogenic contamination. In case of the

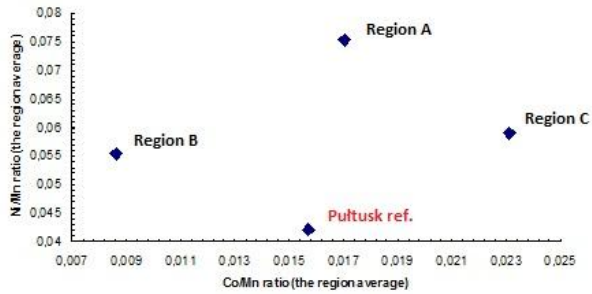

Fig.3. Average concentration of Ni/Mn and Co/Mn ratio in soil samples from different selected representative areas of the "Meteorite Morasko" reserve determined with ICP MS method, measurement errors 10%.

Morasko region such higher content has been obliterated by soil processes lasting over the centuries. There are no significant correlations between abundance of Ni and Co in relation to the concentration of cosmogenic matter (Fig.3). Generally the increased Co content is observed for the *Region C* with the highest extraterrestrial matter concentration [1]. The *Region A* is also characterized by a higher concentration of this chemical component. However, in this case, it may be related to agricultural actions taken in this area. On the other side Co content in soil from the Pułtusk area is similar to the *Region A*. Therefore these correlations require a deeper study.

Conclusions: Presented results of research gave preliminary insight to elemental distribution of soil components which originate from the meteoritic matter scattered in the "Morasko Meteorite" reserve. Distribution of elements depends on the location of sampling. As indicated above there are some correlations between amount of meteorite finds and concentration of Ni, Fe and Co in the ground. Also geological and anthropogenic factors most possible affect the content of studied elements.

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